

READER WITH AN IMAGE RECORDING UNIT FOR READING A CODE AND METHOD FOR READING A CODE

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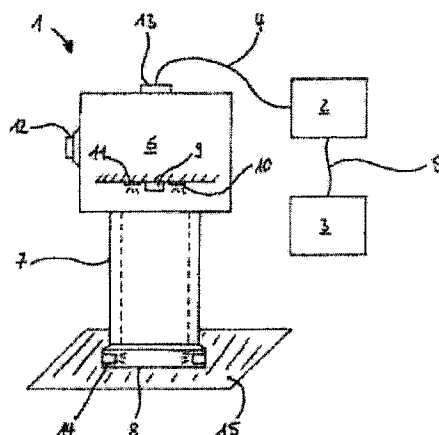
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Abstract of WO 02075637 (A1)

The aim of the invention is to improve the reading of a code. To this end, a reader (1) comprises an image recording unit (9) for reading a code (15), especially for reading a bar code, a two-dimensional code, a three-dimensional code or a color code, which is characterized in that a spacer (7) between the image recording unit and the code is provided with at least one illumination device (14) that illuminates the code preferably from the side.



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Reader with an image pickup unit for reading a code and a method for reading a code the invention relates to a reader with an image pickup unit for reading a code, in particular for reading a bar code, a zweidimensionalen code, a three-dimensional code or a color code, with a spacer to spaced reading of the code.

The mark and code of an article win in trains of the progressive automation in many areas, in particular in the area of the automatic identification, increased at meaning. Here the article is provided with a machine-readable code, whereby the mark of the article various methods become applied. On the one hand the made mark of an article indirect, in which the code on a label applied will and which becomes label on the article fixed which can be marked. On the other hand the mark in addition, direct on the article which can be marked applied become. In particular the mark of an article in the industrial surrounding field wins increased at meaning, whereby the direct mark of the article becomes preferred applied opposite an use from labels to the labeled one of an article.

▲ top The direct mark of an article holds however the disadvantage that to an apparatus, which becomes reading a code used increased requirements in the area of the read ability provided becomes. Such a reader is for example a scanner of which stationary or mobile used becomes.

The increased requirements to a reader result for example from the fact that the nature of a surface of a marked article depends on the manufacturing process and is not normally to the requirements of the reader matched. In addition, the variety from methods to the direct mark of an article the increased requirements to a reader, since this must seize the entire bandwidth of the marking methods. For example a code with color applied with a laser baked or with a tool engraved or imprinted is.

An important class from apparatuses to reading a code consists of the actual reader and an apparatus to the illumination of the coded surface. Here the reader essentially consists of an image pickup unit, which with a computing unit connected is. The image pickup unit consists usually of a lens and photosensitive sensor, which is made by means of a semiconductor technology (CCD or CMOS). The lighting unit can be here fixed with the reader and/or the image pickup unit connected or be however independent of it arranged.

Here the light in the area of the coded surface, emitted of lighting unit and/or another light source, becomes partial reflected. This reflected light becomes of the image pickup unit received and from the computing unit to the purpose of the code reading processed. A suitable illumination of the coded surface is necessary, so that the image pickup unit can take up a significant image of the code. A significant image of the code again is a substantial prerequisite for a reliable read result. In principle a reading is also possible without lighting unit alone the bottom use of the stray light of an ambient light. A lighting unit is however required whenever continuous reliable code readings as well as a large independence of the read reading from the ambient light become required. General ones require various surfaces and various methods of the mark also different types of the illumination, in order to obtain a safe reading. Conventional code readers preferably use illumination devices, which are in the vicinity of the image pickup unit mounted, whereby the illumination devices emit preferably diffuse light.

The arrangement or several light sources in the vicinity of the receiving unit is to be realized constructive relative easy and leads altogether to a compact reader. However a reader, which uses a frontal diffuse illumination, places high demands against the nature of the coded surface and against the quality of the mark. In particular the surface of the coded surface must be so constituted that they must themselves differentiate the incident light diffuse reflected and the information of the code of containing components of the mark regarding its reflection ability significant. Only bottom these conditions is ensured that of the image pickup unit the captured image the code in sufficient clarity again-reflected and the single elements of the code of the computing unit discriminated to become to be able. For example if the single code elements of the mark differ according to its reflection ability only insufficient one from each other and from the code background, a reading becomes very difficult using a frontal illumination or is even impossible. The same applies, if the mark becomes for example applied on a specular surface. In this case the image pickup unit and the illumination device in the area of the mark on the coded surface can be reflected and make thus a correct reading of the code impossible.

It has itself shown that a in such a way constructed reader is good suitable for the reading of contrast-strong codes on diffuse reflecting surfaces as far as possible. In particular applied codes can be read generally with such an apparatus by means of a laser printer or an ink jet printer on matte paper. The reading of low-contrast codes or the reading of codes on reflecting surfaces a prepared in such a way constructed apparatus however generally difficulties.

Such problematic cases are present in particular with the direct marked codes preferred in the industrial surrounding field. The material and the nature of the coded surface cannot become with direct mark any longer free selected, but are by the circumstances of the article which can be marked as far as possible fixed. The choice of a marking procedure is generally likewise reduced by most diverse boundary conditions. So a mark should be more executable if possible inexpensive, which may not become articles which can be marked by the mark in its function affected and eventual existing requirements to the durability of the mark to have satisfied to become. For example the indirect mark mostly separates the mark with ink by means of labels and to the durable mark of a metallic article both, because thereby the required durability cannot be obtained. If the article must take up mechanical forces, a laser inscription from safety reasons is not always allowable. From these reasons the marks become frequent engraved, etched or pressed.

Engraved, etched or printed codes are characterised frequent by the fact that the surface change accompanying with it changes the reflection ability of the coded surface only slight one. As sequence a contrast-weak mark, thus a mark, results with which the coded surface has only a small contrast between the light dark ranges, why such a code with a conventional reader can be read only heavier or directly not at all.

Meanwhile mobile readers, which exhibit a spacer, exist which the reading of a code substantial simplified. Here the spacer has a length, which the image pickup unit of the reader in a defined distance to the code positioned which can be read, so that the code which can be read in lies in the sharp range of the image pickup unit of the reader. Thereby the positioning of the reader becomes relative simplified substantial to a code which can be read in, since expensive settling down of the reader is relative unnecessary to the code. But also such readers have the disadvantage that the illumination devices are in the vicinity of the image pickup unit arranged, so that the code only parallel one is illuminated to the picture recording axle of the image pickup unit.

The invention is the basis the object to develop a reader in such a manner other that a reading of a code, indifferently after which method the code on an article realized is in particular an engraved, printed or etched code, and/or, as the
 ▲ top surface of the article is constituted safe ensured becomes indifferent.

The object becomes device-moderate of a reader with an image pickup unit reading a code, in particular reading a bar code, a two-dimensional code, a three-dimensional code or a color code dissolved, whereby a spacer exhibits an illumination device illuminated preferably lateral between the image pickup unit and the code at least, which the code.

A bottom illumination device is a component equipped with active lamps to be preferably understood, which active light emitted.

It understands itself that with the reader according to invention any information-carrying mark can be read, for reading " with means of machine seeing is suitable. In particular by this also a reading of a so called plain text mark (ocr writing) is to be understood. The reader is suitable the other one not only for reading a bar code, a two-dimensional code, a three-dimensional code or a color code, but rather also a matrix code, a plain text or any other mark, which are suitable to equip an article with a machine-readable information.

The reader according to invention becomes offset thereby into the layer, a code, which is for example realized by a plastic deformation of the article surface to illuminate sufficient so that a safe reading of the code becomes possible. By the lateral illumination the structuring elements of the code stamped in form of a surface change step out, so that also engraved, etched or printed codes without problems can be read. This lighting unit allowed it that also a low-contrast code or even a code, which would exhibit no more contrast with frontal illumination at all is read.

A conventional reader with a frontal diffuse illumination device is only heavier in the layer to recognize recesses in the surface of an article and from a location in the surface of the article, which does not exhibit recess to differentiate. By the lateral illumination device of the new developed reader it is however possible, for example in such a way a surface coded with Erhe bungen and recesses to illuminate that a high-contrast change of grey tone develops, which becomes of sensor of the reader in sufficient degrees a recognized.

With a conventional reader a code, which is applied on a shiny or specular surface, cannot generally likewise be read. This is because of the fact that the specular areas of the coded surface of a code received with a frontal illumination device do not stand out sufficient against marked areas. The specular areas of the coded surface produce sensor on an image of the illumination device and the image pickup unit. This image is neither uniform bright nor uniform dark, which makes a code reading more difficult significant. Besides reflections of the illumination device lead too much bright reflections. These reflections can be so strong the fact that they exceed the dynamic area of the image pickup unit and/or the information-carrying code components on sensor bloomings and thus makes a reading impossible.

The reader according to invention is in contrast to this also in the layer, a code, which is applied on a shiny or specular surface to illuminate sufficient. so that a safe reading of the code possible becomes. Of the lateral illumination the emitted light of the specular surface in a flat angle reflected and arrived therefore not at the image pickup unit. On photosensitive

sensor the specular areas of the coded surface appear dark therefore and stand out significant against the marked areas in the code, which appear brighter for their part on sensor.

It, even if the reader exhibits further a lighting unit, is favourable which the code parallel to the optical picture recording axle of an image pickup unit of the reader illuminates. It understands itself that the illumination device of the spacer can become also used without a conventional lighting unit of the reader.

It is possible that a conventional reader is later equipped with a spacer, which exhibits an illumination device, so that it does not have necessary to select and replace by a new investment an otherwise still functioning reader.

An other execution variant plans that the illumination device at the code-lateral end of the spacer is arranged. Conventional readers exhibit an illumination device in unmit telbarer vicinity to the image pickup unit. Thereby conditional are not illuminated many codes in one sufficient degrees, so that a variety by codes or only insufficient one cannot be read. Is arranged thus that the illumination device at the code-lateral end of the spacer, it is possible, to picture recording-axle-illuminate which code which can be read rather from a radial direction in respect on, when this is with conventional readers the case. If the Beleuch is tungseinrichtung arranged at the code-lateral end of the spacer, she exhibits naturally a larger vicinity to the code which can be read than to the image pickup unit.

According to invention the code which can be read is not only illuminated by the lighting unit by a diffuse light frontal, but the code which can be read becomes additional or exclusive by light illuminates, which hits from a radial direction the code which can be read. This leads to a substantial better differentiation of the marked areas regarding light quantity, in particular with an engraved or in-punched code, the hitting the sensor, so that an article becomes safe identified, which is provided with such a marking variant.

It is particularly favourable, if the illumination device is formed as ring light. The annular array the light of emitting elements leads to a to a large extent homogeneous illumination of the coded surface in the area of the field of view of the image pickup unit. By lateral illuminating of the coded surface the code read achievement of the reader becomes substantially increased, whereby for example also codes on a specular surface are problem-free read. Codes also gelaserte can be better read by additional or exclusive lateral illuminating substantial.

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If the illumination device is in such a manner formed the fact that it illuminates for example the code from all sides, which can be read, becomes a disadvantageous shadowing counteracted, how she can develop for example with a single illuminating of the coded surface.

It is more other favourable, if the illumination device exhibits a light emitting diode (LED) as lighting fixture at least. Thereby if a ring light is to become realized, it is favourable, if this is done via a lining up of a variety of light emitting diodes. The use at least a light emitting diode has for example the advantage that a light emitting diode exhibits one much high luminance with a relative small dimension. This is particularly favourable, since the illumination device is to become preferably immediate in the vicinity of the coded surface positioned, and it with a too large illumination device to an obstruction of vision to come can, since the view is made more difficult to the user of the reader on the coded surface by a too large illumination device.

An other advantage, which speaks for the use at least a light emitting diode, results, if the used light emitting diode of mono chrome sends light. This offers the possibility to reduce with corresponding constructive measures the influence from stray light derived from the environment to. It can become for example at the lens of the receiving unit a filter mounted, which exhibits an high permeability for from the LED emitted mono chrome light. Light, which does not correspond to the monochromen light of the light emitting diode however, will arrive from the filter hindered to to the lens of the receiving unit and does not become so only at all from the photograph sensor registered. For example red light emitting diodes become used lighting up the coded surface, whereby is arranged before the lens of the receiving unit a red filter. Here an increase of the code read ratio can likewise become achieved, so that a time-consuming code rereading is void. An other execution variant plans that the illumination device lighting fixture exhibits different luminous paint.

After the invention is proposed that the illumination device exhibits at least a lighting fixture, whereby the lighting fixture preferably mono chrome light emitted.

It understands itself the fact that also every other technical light source for illuminating the coded surface can be consulted if this regarding the readability of a code brings advantages out.

Lighting fixtures different luminous paint are favourable in particular if color codes are read. Even with an use of an image pickup unit, which can take up only brightness differences however no color differences, a reading becomes possible by the use of colored light different wavelength. For example the lighting unit exhibits red-luminous and green-luminous lighting fixtures, which can be switched from the reader controlled single.

If the color code exhibits for example green or red regions, these areas can become on the basis the bright on sensor appearing projection of the reader identified, different depending upon type of the connected illumination. In this way will an original colorblind reader by the illumination device according to invention into the layer offset to read now also color codes.

Favourable it is also, if the spacer has a mechanism, in and/or. at which a power supply of the illumination device arranged is. Since the power supply is preferably realized by a thin two-vein line, it is particularly important that these filigrane power supply of the illumination device is by a corresponding mechanism protected. For example the spacer exhibits a pipe connection between the reader and the illumination device, is arranged in which the power supply. It is likewise possible that the spacer exhibits a groove, in which a two-vein cable for example by means of a silicone paste embedded arranged is.

A preferred execution variant plans that the illumination device exhibits a connection to a computing unit of the reader. The computing unit takes over the control of the illumination device, so that the illumination device optimum cooperates with the receiving unit.

The connection of the illumination device can be likewise wire-bound here, whereby the wire-bound connection is in the mechanism of the spacer arranged, in which also the Energiezu drove the illumination device arranged is. It is likewise possible that the lighting unit possesses a wireless connection to the computing unit.

The mass of the spacer are in principle arbitrary. However the length of the spacer which can be selected depends on the properties of the receiving unit. It is in particular favourable, if the length of the spacer becomes a so selected that the mark is in the sharp range of the image pickup unit, if the code-lateral end of the spacer on the coded surface or in a slight distance before the coded surface is. At the code-lateral end the inner diameter of the spacer becomes a so selected that the field of view of the receiving unit does not become or only slight affected by the spacer.

A preferred execution variant plans therefore that the spacer exhibits a longitudinal dimension of less than 150 mm, preferably a longitudinal dimension between 50 mm and 100 mm, enclosure. In this way ensured becomes that the reader for the reading becomes brought into a favorable distance the coded surface. Here it is favourable, if the length of the spacer is in such a manner performed that the reader is in a sharp range of the receiving unit, if the spacer on the coded surface rests upon. It turned out that a read reading from 50 mm up to 100 mm for the reading typically used marks is favorable.

It is particularly favourable, if the inner diameter of the spacer is in such a manner dimensioned that the field of view of the camera does not become or only slight affected by the spacer. Favourable way exhibits for this the spacer, preferably at the code-lateral end, an inner diameter of more as 20 mm, preferably an inner diameter of more than 30 mm.

In addition it is favourable, if the spacer, preferably at the code-lateral end, exhibits an inner diameter of less as 60 mm, preferably an inner diameter of less than 50 mm. Thereby a compact configuration of the reader as well as the spacer becomes achieved. Thus again the handling of the reader is substantial facilitated, which in particular with works over a longer period with the reader of advantage is.

Further it is favourable, if the spacer is arranged toward its longitudinal axis relative displaceable to the reader, so that the spacer releases this by a movement toward its longitudinal axis to the reader, for example by means of a pressure switch, so that a reading of the code takes place. Here the pressure switch is for example arranged between the spacer and the housing of the reader, whereby the spacer becomes operated when putting on on a coded surface toward the reader moved and the pressure switch.

The invention suggests that the spacer exhibits a mechanism for activating the image pickup unit and/or the illumination device. Preferably this mechanism at the code-lateral end of the spacer is arranged. For example the mechanism covers a pressure switch or a sensor, so that become activated with a contact with the coded surface or an approximation to the coded surface the image pickup unit and/or lighting unit.

It is particularly favourable, if the spacer exhibits a guard ring at least at an end, preferably at the code-lateral end. Since the code-lateral end of the spacer frequent with the marked article stands in contact, it is favourable particularly to protect this part of the spacer against mechanical stress. In particular if the spacer from a plastic is manufactured. This guard ring can serve for example as flat support surface of the code reader on a coded surface. It is possible that the guard ring is a gain of the spacer, in particular if the spacer from a wire rack is manufactured.

In accordance with an other execution variant it is favourable, if the guard ring exhibits a mechanism, which itself for activating the image pickup unit and/or the illumination device is suitable.

For example a pressure switch or a sensor is arranged at the code-flat of facing side, so that with a contact with the coded surface or become activated with an approximation to the coded surface the image pickup unit and/or the illumination device.

It is particularly favourable, if the illumination device is in the vicinity of the guard ring arranged. In order to protect for example also the illumination device against mechanical stress to avoid and in order a possible glare of the user by the illumination device it is particularly favourable to attach at the code-lateral end for example a transparent tube a guard ring. It is favourable, if the size of the ring is a so selected that the illumination device is hidden by the guard ring and experiences thereby an optimum protection.

In accordance with an other preferredwise feature can the guard ring an light-absorptive material, preferably an opaque material, exhibit. Thereby an otherwise possible glare of the user becomes avoided by the illumination device. Furthermore it is favourable, if the guard ring is so designed that it a light radiation along the optical photograph axle to the receiving unit prevented. For this the guard ring is for example in such a manner designed that an area of the guard ring between the receiving unit and the illumination device is arranged.

It was found that it is favourable, if the guard ring exhibits means, which a light radiation at least an illumination device along the optical photograph axle prevented. Advantage detention is it, if the guard ring is so designed that it a light radiation along the optical photograph axle to the coded surface prevented. For this the guard ring is for example so designed that an area guard ring the code-lateral end of the transparent tube hidden.

It is favourable, if in close proximity of the image pickup unit at least two, preferably two from each other independent lighting units are arranged. These can stand in such a manner with one another in interaction that they illuminate the code-flat particularly favourably. For example the lighting units send alternate light, whereby the lighting units exhibit for example additional still multi colour lighting fixtures. Here the lighting units are realized by in each case an independent assembly with in each case own light series. It is however likewise possible that only in each case a part of the lighting fixtures of a single lighting unit becomes activated and interacts with another part of the lighting fixtures of the same lighting unit alternate. Thus a second separate lighting unit does not exist to real, but is here only simulated ones.

It was found that it is favourable, if the lighting units exhibit multi colour lighting fixtures. This is favourable in particular if a color code is to be read.

Even with an use of an image pickup unit, which can take up only brightness differences however no color differences, a reading of the code becomes possible by the use of colored light different wavelengths. For example the lighting unit exhibits red-luminous and green-luminous lighting fixtures, which can be switched from the reader controlled single.

If the color code exhibits for example green and red regions, these areas could become on the basis the bright on sensor appearing projection the identified, safe different depending upon type of the connected illumination, of the reader. In this way will an original colorblind reader by the illumination device according to invention into the layer offset to read now also color codes.

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The different lighting units stand for example in such a manner with one another in interaction the fact that the lighting units send alternate single or in various combinations light whereby the lighting unit still with multi colour lighting fixtures illuminates the additional code. It is particularly favourable, if the illumination devices become after an algorithmic method, preferably from the decoding unit of the reader, activated and controlled.

It understands itself that the preceding described interaction itself for example also on the lighting unit at the code-lateral end of the spacer extended.

It is other proposed that the spacer is at least narrow constructed at an end, after the invention, preferably at the code-lateral end. By the narrower construction the guard ring can become favourable to the spacer mounted, since the spacer takes up the guard ring at least in parts to itself. For example the spacer at the code-lateral end exhibits a chamfer, which is in such a manner designed that the guard ring can become at least partial arranged in the chamfer. Thereby the advantage results that is manufactured between the guard ring and the spacer a substantial more intimate connection.

It is particularly favourable, if the spacer covers a transparent tube. The transparent tube offers for example an excellent protection against contamination opposite the image pickup unit, in addition, against a contamination of the illumination device. Likewise the positioning of the reader becomes substantial simplified by the arrangement of a transparent tube, since here the possibility exists to see by the tube through and thus the user the position of the reader for the coded surface simple to examine can and if necessary the position easy to correct can.

For example the transparent tube exhibits a guard ring to the protection of the code-lateral end, so that the tube before wear is preserved. Preferably the guard ring from a mechanical high loadable material is made as the tube or it exhibits an elastic surface.

An other execution variant plans that at least a part of the transparent tube is colored.

This is particularly favourable, if a disturbing influence of stray light is to become other reduced.

The coloration of the tube is here for example possible by direct dyeing of a material.

In addition, applying different colour one coating on the transparent tube or applying a film on the transparent tube, can cause a coloration of the tube.

It is particularly favourable, if the coloration of the transparent tube short before the code-lateral end of the tube ends, so that the user a positioning of the reader becomes facilitated, since the view is not limited to the coded surface by the

coloration of the transparent tube in this area.

Here it is for example possible that red light emitting diodes become the illumination of the coded surface used, whereby a red filter is preferably arranged before the lens of the camera and the transparent tube exhibits a bluish green coloration.

A beyond that preferred execution variant plans that the reader exhibits a pistol form with an head portion and a grasp range. Thereby succeeds to hold and positioning safer opposite a coded surface the reader particularly comfortable and simple.

It is favourably, if the head portion exhibits mounting means, with which the spacer releasable fixed at the head portion is anordenbar. Thereby it is possible depending upon application to exchange a first spacer against an other spacer fast and simple.

It understands itself that the mounting means can cover any type of quick-locking mechanisms, which make a fast and simple exchange possible of spacers. For example the mounting means cover a bayonet fixing, a putting catch or a thread, with which the spacer can become fast mounted at the head portion.

In order to be able to realize the power supply of an illumination device of a spacer structural particularly simple, it is favourable, if the mounting means exhibit an energy conductive contact means, which the power supply for the illumination device of the spacer makes available.

Beyond that it is favourable, if in the head portion a decoder and/or an optical signal transmitter are arranged.

It understands itself that the decoder, how managing already mentioned, external outside of the reader operated can become, and the reader by means of a suitable interface with the external decoder connected is.

It is favourable, if the optical signal transmitters a multi color light emitting diode covers, whereby a red-luminous light emitting diode indicates a reader readiness and a green-luminous light emitting diode successful reading of a code.

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Cumulative one and/or. alternative for this is favourable it, if in the head portion or in the grasp range an acoustic signal transmitter is arranged. By means of the acoustic signal transmitter an user different operating states of the reader can become displayed.

Furthermore the object according to invention becomes dissolved of a transparent tube with a Beleuch tungseinrichtung, whereby the illumination device covers a main illuminating axle and the main illuminating axle to the longitudinal axis of the transparent tube exhibits an angle. Advantage wise is the illumination device at an end of the transparent tube arranged, so that she favourably illuminates the immediate area in the vicinity of the transparent tube.

It is particularly favourable, if the angle exhibits a value between 45 and 90, preferably a value of more than 85. Particularly, if the angle of the main illuminating axle is more than 85, the coded surface particularly favorable is illuminated, since the coded surface is illuminated here essentially lateral.

A preferred execution variant of the transparent tube plans a means for fixing the transparent tube at a reader for reading a code, in particular for reading a bar code, a two-dimensional code, a three-dimensional code or a color code. By fixing the transparent tube at the reader that becomes reading of a code substantial simplified, since the transparent tube in such a manner specifies the distance between an image pickup unit of the reader and the code that the code is with a reading in the optimum sharp range of the image pickup unit.

It understands itself that the transparent tube can exhibit all preceding features described in the text cumulative or single in each case.

The object according to invention becomes on the other hand dissolved, in particular reading a bar code, from a method to reading a code, a two-dimensional code, a three-dimensional code or a color code, by means of a reader with an image pickup unit, whereby the code in an angle is illuminated to the picture recording axle of the image pickup unit. Because the code is illuminated now lateral, radial is illuminated, a low-contrast coded surface in such a manner good that she can be read without problems by means of the receiving unit of the reader. This is particularly favourable, since in particular a mobile used handheld reader must read a variety in of different marking types. For example now also a handheld reader without problems can become used to illuminate a strong shiny or specular coded surface optimum or it can used become to read a mark which is realized on basis of an engraved, etched, printed or punched code on an article.

Here it is particularly favourable, if the code a bottom angle between 45 and 90, a preferably bottom is illuminated angle of more than 85. In the case of a such illuminating of a code an engraved or in-punched code particularly good can be read, there itself here the resultant brighter and darker areas of the engraved and/or. punched code particularly good for the image pickup unit highlighted becomes.

It understands itself that with the invention process any information-carrying mark can be read, whose information with

means of machine seeing can become "read".

Such information-carrying marks become understood in the sense of the invention as code. This applies in particular to a reading of a so called "plain text" - for mark (ocr writing).

Likewise it is favourable, if the illumination device is switched off algorithmically ein-und.

This is favourable in particular if the lighting mode is in such a manner set that at least a frontal and at least a lateral illumination in fast sequence are switched off alternately an-und. Here the image pickup unit an alternate image pickup with frontal and lateral illumination becomes offered, whereby the success of a correct reading becomes also significant increased with a problematic mark.

Straight one with a lighting procedure with several illumination devices is favourable it that various lighting modes set to become to be able, in order to realize so an optimum lighting adjustment to various applications. For example the reader according to invention becomes in such a manner operated the fact that a frontal illumination illuminates alone the code which can be read that a lateral illumination illuminates the code which can be read alone or that the frontal illumination as well as the lateral illumination common that illuminates code which can be read.

In the long run proposed becomes that at least two lighting units of the reader algorithmically light, preferably mono chrome light, to emit. The code-flat which can be lit up can be illuminated by this procedure favourably, since the reader can select to the improved readability between at least an other lighting mode. It understands itself that this method can become also independent used of the remaining process variants.

Other advantages, targets and properties of instant invention become described on the basis subsequent explanation of accompanying drawing, according to invention is exemplary schematically illustrated in which a code reader.

It shows fig 1 a schematic side view of a reader, fig 2A a schematic arrangement of a guard ring, fig 2B a schematic alternative arrangement of a guard ring fig 3 an isometric side view of a reader, fig 4 an isometric plan view of a reader, fig 5 and 6 two schematic views from downside to the reader according to invention in different perspectives, fig 7 a transparent tube in an isometric side view and fig 8 a schematic plan view of an alternative reader in form of a Le sepiostole.

The fig 1 shows a reader 1, a decoding unit 2 and a PC 3. The reader 1, the decoding unit 2 and the PC 3 are among themselves with a tax spiral 4 and/or. 5 connected. The reader covers a cylindrical metal case 6 and a Plexiglas®-Rohr 7, D. h. a tube from transparent plastic. At the bottom end of the Plexiglas®-Rohrs 7 a guard ring is 8 arranged.

In the metal case 6 are one image pickup unit 9 as well as two frontal lighting units 10 and 11. The two frontal lighting units 10 and 11 are connected in such a manner to each other that they send alternate mono chrome light. The other one the cylindrical metal case 6 on its outer surface as well as at the upper face an interface 13 to the decoding unit 2 orders a trigger 12.

Integrated into the guard ring 8 is a ring lighting 14, which consists of a variety of light emitting diodes.

The reader 1 rests upon with its guard ring 8 a coded surface 15 of an article.

Here the distance between the image pickup unit 9 and the coded surface is 15 to 70 mm fixed, so that the coded surface 15 lies in the sharp range of the image pickup unit 9. If the trigger becomes 12 operated, the lighting units 10 and 11 as well as the ring lighting according to invention 14 illuminate the coded surface 15, so that the image pickup unit 9 can take up the code.

The inner diameter of the Plexiglas®-Rohrs 7 and the guard ring 8 is so dimensioned with 32 mm diameters that the field of view of the image pickup unit 9 not substantial is limited. Here thus the field of view of the image pickup unit is 9 so designed that the code on the coded surface 15 unobstructed can be read in.

Fig 2A shows a part of the wall of the Plexiglas®-D tube 7, schematically illustrated at whose code-lateral end 16 the guard ring is 8 in a departure. The guard ring 8 is here so formed the fact that it locks the Plexiglas®-Rohr 7 in form of a flat plane and thus on the one hand protects the tube and on the other hand a light radiation of the ring lighting 14 along the optical photograph axle to the coded surface effectively prevented. The other one the ring lighting is 14 arranged within the guard ring 8. Here the lighting ring 14 to the one of the guard ring 8 and on the other hand by the Plexiglas®-Rohr 7 is encased, so that the ring lighting 14 before contamination and damage is protected arranged. Spaced of the ring lighting 14 is the picture recording axle 17 of the image pickup unit 9 shown. Vertical on the picture recording axle 17 is the coded surface 15 schematic shown.

Likewise shown is the main illuminating direction 14 ' of the illumination device 14, whereby the main illuminating direction 14 ' includes an angle 17 with the picture recording axle 17 '. The illumination device 14 illuminates the code on the coded surface 15 from the side.

The fig 2B shows likewise a part of the wall of a Plexiglas tube 7', schematically illustrated at whose code-lateral end 16' a guard ring is 8' in a departure. The guard ring 8' is here likewise so formed the fact that it locks the Plexiglas tube 7' in form of a flat plane and thus on the one hand protects the tube and on the other hand a light radiation of the ring lighting 14 along the optical photograph axle to the coded surface effectively prevented. The other one 'a ring lighting is 14' arranged within the guard ring 8'. The Plexiglas@-Rohr 7' exhibits a substantial smaller outer diameter in the area 16'. This therefore results that at the code-lateral end 16' of the plexiglass tube 7' at the outside outer surface a material recess along the surface plexiglass - tube 7' present is. In this material recess the guard ring is 8' at least arranged partial with the ring lighting 14". Also here the lighting ring 2" to the one of the guard ring 8 is encased' and on the other hand by the Plexiglas@-Rohr 7', so that the ring lighting 14" is here likewise protected arranged before contamination and damage. Favourable way must shine with this arrangement from the lighting ring 14" emitted light not by the complete material thickness of the plexiglass tube 7', but only a part of the Plexiglas@ Materials 7' durchdringen. Here the emitted light experiences a smaller attenuation and/or a smaller deflection by the plexiglass =Material. This therefore results among other things that from the lighting ring 14" emitted light does not have to pass through the complete wall thickness of the Plexiglas@-Rohres 7'. In addition the guard ring builds for 8' as a guard ring 8 narrow regarding its diameter, which is 7 arranged at the outside scope of the Plexiglas@-Rohres.

The metal case of the reader I shown in fig 3 has a lid 18 and a lid 19, become 6 limited with which the faces of the metal case. On the outer surface 20 of the metal case 6 a trigger is 12 placed, becomes triggered with which the reading of the code. At the lid 18 the interface is 13 central arranged, becomes 2 manufactured with whose assistance a connection between the reader 1 and the decoding unit. At the lower side in the area of the lid 19 the Plexiglas@ tube 7 of the reader is 1 arranged. At the code-lateral end of the Plexiglas@-Rohres 7 is the guard ring 8, which takes up the ring lighting 14. The ring lighting 14 consists here of a variety of together gereihten light emitting diodes. The other one the plexiglass exhibits =Rohr 7 a groove 20, in which a power supply of the tonnenförmigen metal case 6 to the ring lighting 14 runs.

In fig 4 tonnenförmige metal cases shown 6 has a lid 18. The lid 18 is here 6 connected positive with the metal case by means of four screws 21.22.23 and 24. At the lid 18 two indicator lamps are 25 and 26 arranged, which indicate the status of the reading of the code visual. Here the marked indicator lamp 25 by radiating a red light that the code was not read. The indicator lamp 26 however signaled by a green light that the code was read. In the center of the lid 18 the interface 13 arranged, whereby the interface exhibits 13 at their sides two threaded bushes 27 and 28, with whose assistance a connector positive with the interface 13 is and thus with the entire reader 1 connected become can.

▲ top The bottom portion of the reader 1 shown in fig 5 shows the schematic guard ring 8 at the code-lateral end of the Plexiglas tube 7. Significant ones are to be recognized the single light emitting diodes of the ring lighting 14 in the guard ring 8. By the other end of the Plexiglas@-Rohres 7 one recognizes the lower lid 19 of the metal case 6. The lid 19 is 6 screwed with two screws 29 and 30 to the metal case. In the area of the lid 19 is the frontal lighting unit 10 and 11, which consists of a variety of light emitting diodes. Central in the metal case arranged is the camera objective 31 with the image pickup unit 9.

The bottom portion of the reader 1 shown in fig 6 shows the indicated metal case 6 and the Plexiglas tube 7. The plexiglass =Rohr 7 exhibits here a groove 20, in which the power supply of the ring lighting 14 runs. The ring lighting 14 is here between the plexiglass =Rohr 7 and the guard ring 8 arranged.

The plexiglass shown in fig 7 - tube stands on a coded surface 32. At the bottom end of the Plexiglas@-Rohres 21 is an illumination device 33, whereby the illumination device 33 exhibits a variety of lighting fixtures 34 (exemplarily for all other lamps only shining body is numbered). The lighting fixture 34 has here a main illuminating axle 35, which exhibits an angle 36 to the longitudinal axis 37 of the Plexiglas tube 31. The illumination device 33 illuminates the code of the coded surface 32 lateral with their lighting fixtures 34.

At the other end plexiglass of the =Rohres 31 is a means 38 for fixing the plexiglass tube 31 at a reader arranged. The means 38 for fixing the Plexiglas@-Rohres 31 exhibits two tabs 39 and 40, which for adjusting plexiglass - tube serve 31 at a reader.

The code pen 41 (fig 8) covers an head portion 42 and a grasp range 43. The head portion 42 of the code pen 41 exhibits an image pickup unit 9 (see fig 1) in form of a digital camera, a first illumination device 10 and 11 (see fig 1) to the frontal illumination of the code, a decoder 44 and a multi color light emitting diode 45.

By means of a connector 46 a ring light essay 47 at the head portion 42 of the code pen is 41 fixed however releasable arranged.

The ring light essay 47 covers a ring light 48, which is 47 arranged at the code-lateral end of the ring light essay and illuminates one code lateral which can be read. The ring light essay 47 is here a transparent tube, which covers a guard ring 47A at least at the code-lateral end.

In order to supply the lighting fixture 49 of the ring light 48 with energy, the connector 46 exhibits contact means 50. By means of the contact means 50 is an electrical power supply between the code pen 41 and the replaceable ring light essay 47 ensured, so that the ring light becomes 48 supplied safe fast in structural particularly simple way and with energy.

The multi color light emitting diode 45 is suitable in particular for the display of a read readiness as well as for the display

of a read code. For example the multi color light emitting diode 45 during the read reading red shines and after reading a code shines it for green.

By a so simple connector 46 the ring light essay 48 can become as accessory complementary the code pen 41 offered. For example thus the code pen can become 41 depending upon application with different ring light photographs 47 equipped. The grasp range 43 of the code pen 41 a possible user a simple handling of the code pen 41 and exhibits a switch 51 for releasing the code pen 41. Favourable way sits the switch 51 relative far above 43 at the head portion 42 close at the grasp range and is ergonomic in such a manner designed that for simple and convenient operation a finger of an user can put around the switch 51 easy.

Beyond that the grasp range 43 covers a bleeper 52, with which an operating state of the code pen can become 41 audible displayed. In this embodiment the bleeper is 52 lateral 43 arranged at the grasp range. Preferably the bleeper is however in the rear, the switch 51 remote area arranged.

Cumulative one and/or. the code pen 41 a sleeve 53 has alternative to the internal decoding unit 44 to the receptacle of a connector 54 and a connection cable 55.

By means of the connector 54 and the connection cable 55 the code pen becomes 43 with electric power supplied and the read in code outputted if necessary.

If an embodiment of a code pen 41 does not cover internal decoding unit 44, a read in code becomes to a remote decoding server 2 (see fig 1) for decoding transmitted by means of the connector 54.

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Claims: 1. Reader (1) with an image pickup unit (9) for reading a code, in particular to the Le sen a bar code, a two-dimensional code, a three-dimensional code or one Color code, characterised in that a spacer between the image pickup unit (9) and the code at least an illumination device (14; 33) exhibits, which the code preferably lateral illuminated.

2. Reader (1) according to claim 1, characterised in that the illumination device (14; 33) at the code-lateral end (16) of the spacer arranged is.

3. Reader (1) after one of the claims 1 or 2, characterised in that the Beleuch tungseinrichtung (14; 33) as ring light formed is.

▲ top 4. Reader (1) after one of the claims 1 to 3, characterised in that the Beleuch tungseinrichtung (14; 33) as lighting fixture at least a light emitting diode (LED) exhibits.

5. Reader (1) after one of the claims 1 to 4, characterised in that the Beleuch tungseinrichtung (14; 33) at least exhibits a lighting fixture, whereby the Beleuch more tungskörper preferably mono chrome light emitted.

6. Reader (1) after one of the claims 1 to 5, characterised in that the Beleuch tungseinrichtung (14; 33) Lighting fixture different luminous paint exhibits.

7. Reader (1) after one of the claims 1 to 6, characterised in that of the Abstandhal more ter a mechanism (20) exhibits, in and/or at which a power supply of the lighting mechanism (14; 33) arranged is.

8. Reader (1) after claims a 1 to 7, characterised in that the lighting mechanism (14; 33) a connection to a computing unit of the reader (1) exhibits.

9. Reader (1) after one of the claims 1 to 8, characterised in that of the Abstandhal more ter a longitudinal dimension of less than 150 mm exhibits, preferably a longitudinal dimension between 50 mm and 100 mm exhibits.

10. Reader (1) after one of the claims 1 to 9, characterised in that of the Abstandhal more ter, preferably at the code-lateral end, an inner diameter of more than 20 mm, preference/advantage a wise inner diameter of more than 30 mm, exhibits.

11. Reader (1) after one of the claims 1 to 10, characterised in that the distance owner, preferably at the code-lateral end, an inner diameter of less as 60 mm, preferably an inner diameter of less than 50 mm, exhibits.

12. Reader (1) after one of the claims 1 to 11, characterised in that the distance owner toward its longitudinal axis relative displaceable to the reader (1) arranged is.

13. Reader (1) after one of the claims 1 to 12, characterised in that the distance owner a mechanism for activating the picture taking up fig. (9) and/or Beleuchtungsein direction (10,11; 14 ; 33) exhibits.

14. Reader (1) after one of the claims 1 to 13, characterised in that the distance owner at least at an end, preferably at the code-lateral end (16), a guard ring (8.8 ') exhibits.

15. Reader (1) according to claim 14, thus identified-draws that the guard ring (8.8 ') direction for activating the image pickup unit (9) and/or the illumination device (10,

11 ; 14 ; 33) exhibits.

16. Reader (1) after one of the claims 14 or 15, characterised in that in the vicinity of the guard ring (8.8 ') the illumination device (14; 33) arranged is.

17. Reader (1) after one of the claims 14 to 16, characterised in that the protection ring (8.8 ') an light-absorptive material, preferably an opaque material, exhibits.

18. Reader (1) after one of the claims 14 to 17, characterised in that the protection ring (8.8 ') a means exhibits, which a light radiation at least Beleuchtungsein a direction (14; 33) along the optical photograph axle (17; 37) prevented.

19. Reader (1) after one of the claims 1 to 18, characterised in that in unmittelbarer vicinity of the image pickup unit (9) at least two, preferably two from each other unab hängige lighting units (10,11) arranged are.

20. Reader (1) after one of the claims 1 to 19, characterised in that at least a lighting unit (of 10,11) multi colour lighting fixtures exhibits.

21. Reader (1) after one of the claims 1 to 20, characterised in that the distance owner at least at an end, preferably at the code-lateral end (16) is narrower.

22. Reader (1) after one of the claims 1 to 21, characterised in that the distance owner a transparent tube (7; 31) covered.

23. Reader (1) according to claim 22, characterised in that at least a part of the through sichtigen tube (7; 31) colored is.

24. Reader (1) after one of the claims 1 to 23, characterised in that the reader (1) a pistol form with an head portion (42) and a grasp range (43) exhibits.

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25. Reader (1) according to claim 24, characterised in that the head portion (42) a Befestigungsmittel (46) exhibits, with which the spacer is anordenbar releasable fixed at the head portion (42).

26. Reader (1) according to claim 25, characterised in that the mounting means (46) one Energy conductive contact means (50) exhibits, which makes a power supply available for the Beleuchtungseinrichtung (48) the spacer.

27. Reader (1) after one of the claims 24 to 26, characterised in that in rich (42) a decoder (44) and/or an optical signal transmitter (45) arranged is.

28. Reader (1) after one of the claims 24 to 27, characterised in that in the Kopfbereich (42) or within the grasp range (43) an acoustic signal transmitter (52) arranged is.

29. Transparent tube (7; 31) with an illumination device (14; 33), whereby the Beleuchtungseinrichtung (14; 33) a main illuminating axle (14 '; 35) covered, thus gekenn it draws that the main illuminating axle (14 '; 35) an angle (17 '; 36) to the longitudinal axis (37) of the tube (7; 31) exhibits.

30. Transparent tube (7; 31) according to claim 29, characterised in that of the angles (14 '; 36) a value between 45 and 90, preferably a value of more than 85, exhibits.

31. Transparent tube (7; 31) after one of the claims 29 or 30, characterized by Means (38) to fixing the transparent tube (7; 31) at a reader (1) to reading egg of nes code, in particular for reading a bar code, a two-dimensional code, three dimensional codes or a color code.

32. Methods for reading a code, in particular for reading a bar code, one zweidimensionalen codes, a three-dimensional code or a color code, by means of a reader (1) with an image pickup unit (9), by the fact identified-drawn that the code in an angle (17 '; 36) to the picture recording axle (17) of the image pickup unit (9) one illuminates.

33. Process according to claim 32, characterised in that the code a bottom angle (17 '; 36) between 45 and 90, a preferably bottom angle of more than 85, is illuminated.

34. Process according to one of claims 32 or 33, characterised in that the Beleuchtungseinrichtung (14; 33) algorithmically ein-und one switches off.

35. Process according to one of claims 32 to 34, characterised in that at least two Lighting units (10,11) of the reader (1) algorithmically light, preferably mono of chrome light, emit.